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Not Ready for the "First Space War," What About the Second?

by

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Lieutenant Colonel, U.S. Air Force

A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of Navy.

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For the first time in history, space systems were employed during the Persian Gulf War at not only the strategic level of war, but also at the operational and tactical levels as well. Space-borne assets had a dramatic effect on the ability of the operational level commander to successfully plan and prosecute a comprehensive warfighting campaign. This paper outlines the mission capabilities of U.S. Space Command, and its components, and examines how space assets contributed to concrete, coherent military action at the operational level of war in support of the ultimate national political goals and objectives. The impact of space forces during Operations Desert Shield/Desert Storm, specifically force enhancement assets, is examined and six implications for the future are offered.

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Abstract of

Not Ready for the "First Space War,"

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For the first time in history, space systems were employed during the Persian Gulf War at not only the strategic level of war, but also at the operational and tactical levels as well. Space-borne assets had a dramatic effect on the ability of the operational level commander to successfully plan and prosecute a comprehensive warfighting campaign. This paper outlines the mission capabilities of U.S. Space Command, and its components, and examines how space assets contributed to concrete, coherent military action at the operational level of war in support of the ultimate national political goals and objectives. The impact of space forces during Operations Desert Shield/Desert Storm, specifically force enhancement assets, is examined and six implications for the future are offered.

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Not Ready for the "The First Space War," What About the Second?[1]

Lieutenant Colonel Steven J. Bruger, U.S. Air Force

Basking in the warm light of success following the Persian Gulf War, U.S. Air Force Chief of Staff Merrill A. "Tony" McPeak declared it was "the first space war."[2] For without a viable space capability to provide support to the terrestrial warfighter, the outcome of the Gulf War may well have been quite different--one with disastrous consequences not only for the governments of the United States and its allies, but also for coalition military forces as well.

Once the U.S. and its coalition allies embarked upon a course of action which sought a military solution to the crisis, failure to achieve the coalition's objectives carried tremendous risk. At stake was the Mid-East balance of power; the credibility of the United Nations and its ability to influence future world events; a stable flow of Mid-East oil to the West; renewal of a guttural domestic examination of U.S. political policy and military capability; and the international political, economic, and military power of the world's remaining superpower, the United States. Instrumental in not only preventing the downside consequences of failure, but also ensuring success was the capability of America's High Frontier.

Space-borne assets had dramatic effect on the ability of the operational commander to successfully prosecute a comprehensive campaign to achieve the objectives of the United States and coalition forces. This paper examines the use of space forces, specifically force enhancement assets, during Operations Desert Shield/Desert Storm and provides an analysis of impact and implications at the operational level of war. As a point of departure, it is first necessary to understand the space missions and organizational structure of space forces in place during the Persian Gulf War.

Missions and Organizational Structure

Unified Command

U.S. Space Command (USSPACECOM) is the unified command responsible for a wide variety of space related missions. First and foremost, USSPACECOM is responsible for integrated threat warning and attack assessment. In addition, USSPACECOM has four operations-related missions in space. These are: space control, which consist of space surveillance, space force survivability[3], negation operations [anti-satellite (ASAT) operations],[4] and battle management, command, control, and communications (BMC^3); space support which is comprised of lift (i.e. launch) and satellite control operations; space force enhancement to provide warning, navigation, communication, and weather capability; and space force application, consisting of offensive and defensive operations to support the terrestrial warfighter. Finally, it is responsible for ballistic missile defense planning.

Component Commands

USSPACECOM, created in 1985 at Peterson AFB, CO, is the "warfighting" command; as such, it is responsible for all U.S. military space assets. During the Gulf War, its force structure came from three component commands: Air Force Space Command (AFSPACECOM), headquartered at Peterson AFB, CO; Army Space Command (ARSPACECOM), also headquartered at Peterson AFB, CO; and Naval Space Command (NAVSPACECOM), headquartered at Dahlgren, VA. USSPACECOM and each of these three component commands had individual mission responsibilities which supported the broader functional areas of USSPACECOM space operations. In general, each component command was responsible for organizing, training, and equipping its space forces, for the complete integration of space capabilities into its own service operations, and for providing support and resources to USSPACECOM. Specifically, these responsibilities were broken out by service along functional lines largely oriented toward specific service mission which also had the added benefit of spreading the high cost of space utilization across the services.

Component Command Responsibilities

AFSPACECOM provided strategic and ballistic missile warning through an array of space and ground-based sensors. The space-based sensor, called Defense Support Program (DSP) satellites, were "'usually' the first system to detect missile launches."[5]

The major ground-based sensors were mechanical and phased-array radars deployed in two networks called the Ballistic Missile Early Warning System (BMEWS)[6] and Phased Array Warning System (Pave Paws)[7], designed to detect primarily ICBM and SLBM launches respectively.

AFSPACECOM also provided ephemeris (celestial position) data on approximately 7,000 orbiting space objects through a dedicated world-wide space surveillance network of nearly 30 ground-based mechanical and phased-array radars, optical, electro-optical, and passive surveillance systems. Ground-based missile warning sensors were also capable of providing tracking satellites and providing space surveillance data.

In addition, AFSPACECOM was responsible for command and control of a number of satellites, such as weather (Defense Meteorological Satellite Program--DMSP), navigation (Global Positioning System--GPS), communication (Defense Satellite Communications System--DSCS) and warning (Defense Support Program--DSP).[8]

Finally, AFSPACECOM was responsible for space launch operations; west coast launch operations were conducted at

Vandenburg AFB, CA and east coast operations were conducted at Patrick AFB, FL.[9]

NAVSPACECOM was responsible for command and control of the Fleet Satellite (FLTSAT) network.[10] FLTSAT was augmented by a commercial satellite, LEASAT, which was operated by Hughes. Together FLTSAT and LEASAT comprised a comprehensive communications system called Fleet Satellite Communications System (FLTSATCOM), which provided ultra-high frequency (UHF) voice communications to users.[11] NAVSPACECOM also operated a "fence" of space surveillance radars across the 33rd parallel of the continental U.S. which contributed to maintaining ephemeris data on the nearly 7,000 orbiting space objects.

ARSPACECOM was responsible for the payload of the Defense Satellite Communications System (DSCS), while AFSPACECOM commanded and controlled (i.e. "flew") the satellites. These satellites provided secure voice and data communications for the Department of Defense (DoD) in both the UHF and super-high frequency (SHF) bands of the frequency spectrum.[12]

IMPACT

Communications, weather, navigation, and warning systems (conceived, built, and deployed to support strategic deterrence and should it have failed, global nuclear war) were pressed into place in the Commander-in-Chief's (CINC's) theater of operations to support the major force buildup and the sequential air and ground campaigns. The ultimate purpose, of course, was to achieve the national or strategic objectives with truly joint forces while minimizing cost and risk.

Communications

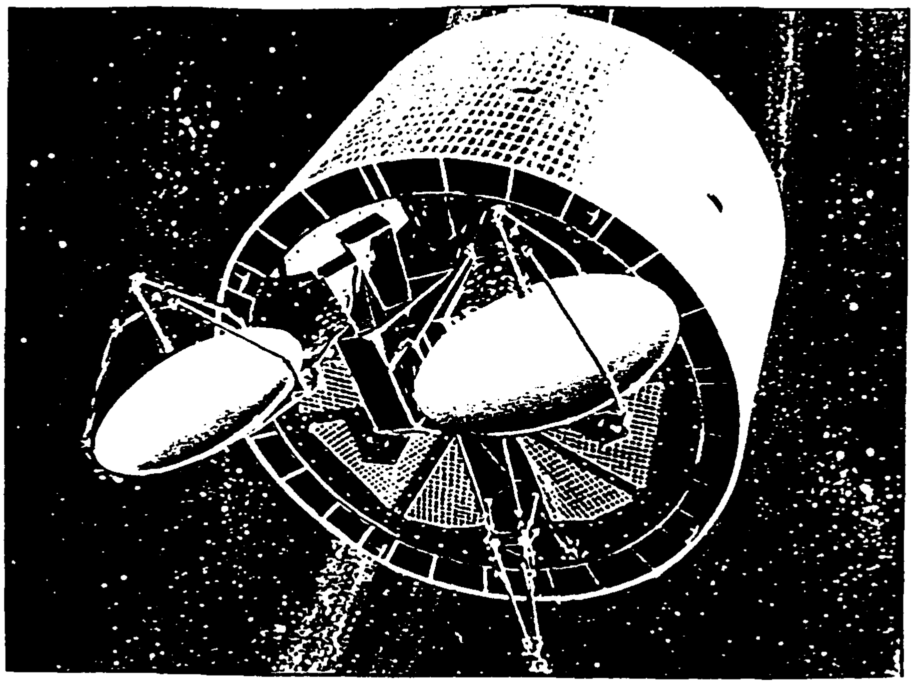
During the most intense part of Desert Storm, the coalition communications systems carried more than 700,000 telephone calls and 152,000 messages per day[13] with a readiness rate of over 98%.[14] Satellite communications systems formed the primary path of the communications network, bearing 85% of the total inter- and intra-theater communications load.[15] Desert Storm marked the first time in history that intra-theater satellite communications were used to support the terrestrial warfighter.[16] Instant, nonline-of-sight communications were provided up and down the chain-of-command, in a theater of operations that did not possess a rigorous indigenous communications capability.

At the operational level of war, satellite communications permitted the coordination of the air, sea, land, space, and special operations forces and integrated them into a total campaign plan to achieve the objectives. It enabled warning of Scud attacks to not only theater forces, but to Israel as well. As discussed below, this was a key element in preventing fragmentation of the coalition. Real-time direction was provided to tactical forces in order to exploit their successes.

Satellite communications, both inter- and intra-theater, permitted the "100-hour ground war." Without space-borne communications, the rapid transfer of battlefield success and information from the tactical to the operational commander and then to the strategic-level decision makers would not have been possible. Once the decision to terminate ground offensive operations was made, the decision was relayed down the chain-of-command rapidly to prevent the "scales of balance" from being tipped over. Note the boundaries between the operational-strategic level and the operational-tactical level lack distinct definition; they are fuzzy in shape and gray in color. Nevertheless, inter- and intra-theater, over-the-horizon satellite communications permitted the synchronization, maneuver, and surprise of massive amounts of firepower which were critical to the operational commander's concept of operations.

It took _months_ to weave this communications net together without benefit of a comprehensive operations plan to aid the supporting or supported CINC. Unique communications architectures and plans were put together in a massive web. Satellite channels from other users were chopped over to U.S. Central Command as required, and many thousands of ground terminals had to be transported into the theater because they had not been deployed with the operational field units.[17]

Space asset relocation to support communications requirements was accomplished by moving a DSCS II satellite from its geosynchronous Pacific Ocean orbit to an Indian Ocean orbit to supplement two other communications satellites--an existing Indian Ocean DSCS II and the East Atlantic DSCS III.[18,19] In addition, a British military communications satellite, SKYNET, was used in accordance with an existing memorandum of understanding to enhance U.S. and United Kingdom interoperability.[20] Furthermore, FLTSATCOM satellites carried more than 95% of all U.S. Navy UHF traffic. In fact, these satellites were used to maximum capacity,[21] limited because of their lower operating frequency.[22] It was not until just prior to the new year that the over-taxation of FLTSATCOM was eased by the availability of a Lincoln Laboratories UHF satellite. Additionally, commercial satellite communications, such as INTELSAT, which provided VII Corps connectivity to Europe, were leased to provide additional capability.[23] And lastly, one-of-a-kind resources were pressed into operational use: naval forces used two Defense Advanced Research Projects Agency experimental communications satellites, MACSAT (Multiple Access Communications Satellite), for relaying long-haul logistics information.[24,25]



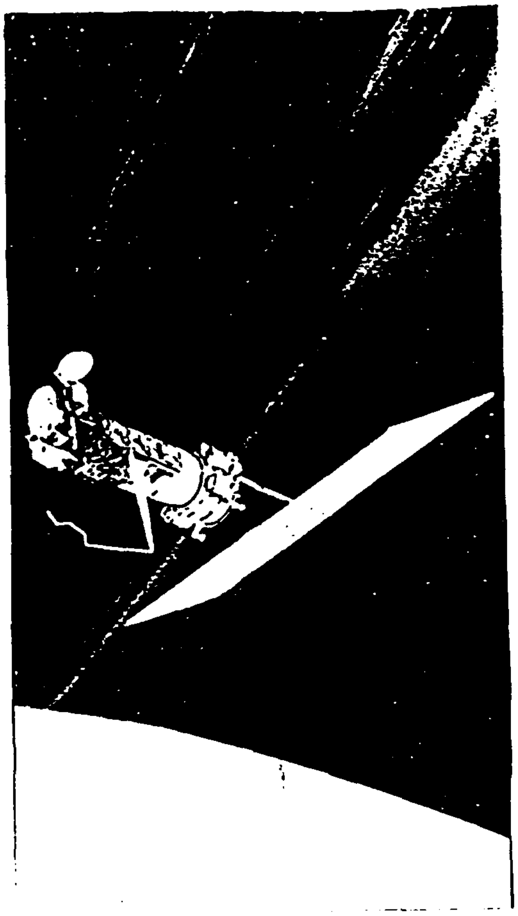
DSCS Satellite

Weather

The most reliable source of real-time weather data deep inside the Kuwaiti Theater of Operations was from weather satellites such as DMSP. Equipped with a passive microwave radiometer and infrared temperature/moisture sounder, DMSP satellites enabled meteorologists to determine ocean surface wind speed, temperatures at various altitudes, areas and intensity of precipitation, amount of water and/or cloud cover, and soil moisture content.[26]

DMSP data enabled long-range weather prediction in support of the comprehensive Desert Storm operations plan: it was used to predict sandstorms, to "what if" the threat of chemical attack (by providing weather data such as temperature, humidity,[27] wind speed and direction), and to plan the air and ground campaigns.[28]

Military commanders throughout the theater had the capability to receive weather data, such as photographic-quality prints of cloud cover, four times per day.[29] Specific weather information (such as temperatures at various altitudes, areas and intensity of precipitation, amount of water and/or cloud cover, and soil moisture content) was particularly important for the planning and employment of laser and infrared weapon system sensors and designators/illuminators for precision guided munitions.[30] Large areas of the theater of operations were surveyed by satellites to determine the density of the desert soil in order to support armored operations, such as General Schwarzkopf's left hook around Iraqi forces; analysis of DMSP microwave imagery to determine soil moisture content provided this information on a large scale.[31] In addition, this satellite weather data was used tactically to provide mission planners with weather forecasts, to update flight crews, command and maneuver elements, etc. prior to mission execution, and to warn of impending sandstorms.[32]



DMSP Satellite

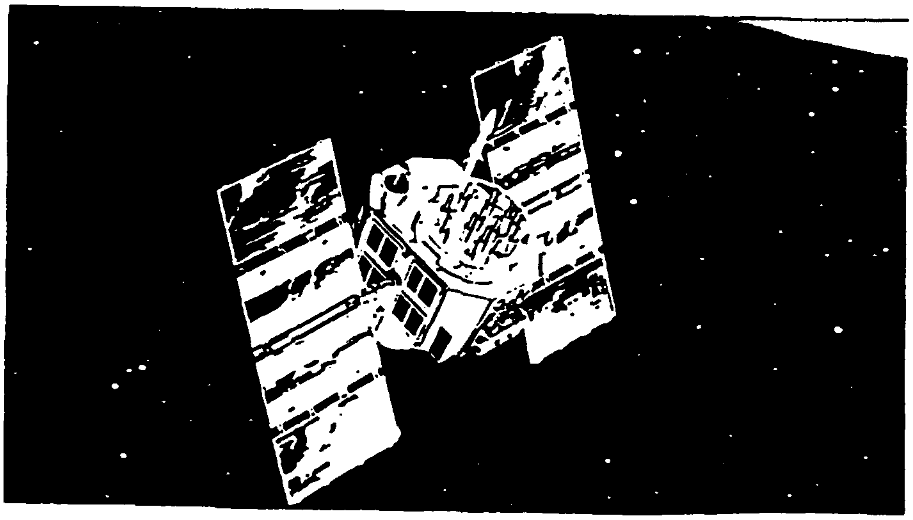
Data was downlinked from the satellite directly into the theater through transportable DMSP ground station vans. Because these vans were large due to older technology and therefore required excessive amounts of airlift, AFSPACECOM developed and deployed two prototype mobile units late in the war. AFSPACECOM took advantage of state-of-the-art electronics and processing capability to reduce the stations to a size compact enough to fit in the back of an Army high-mobility multi-purpose utility vehicle.[33]

Navigation

The thirteen on-orbit Global Positioning System (GPS) satellites provided two and three dimensional positional data to coalition forces.[34] In August of 1990 at the time of the Iraqi invasion of Kuwait, the full complement of GPS satellites was not in orbit and the system had not reached operational capability.[35] Nevertheless, GPS satellites were one of the most critical assets to not only operational commander, but also the tactical warfighter as well.

At the operational level of war, GPS aided the planning and prosecution of a quick, lethal, and decisive campaign. Without GPS, the commander simply could not have planned or waged such an intense and precise campaign to accomplish the coalition objectives while reducing cost and risk. The lack of GPS would have degraded the timing and tempo of the air and ground campaigns. The lack of GPS would have diminished the accuracy of weapons, resulting in more civilian casualties and more casualties by friendly fire. This in turn, could have negatively influenced the coalition's ability to stay together and, over time, may have undercut U.S. public support and national resolve.

At the tactical level, the U.S. military services had not planned to equip units at the lowest levels, such as platoons or squads, with GPS receivers.[36] As a result, at the beginning of Desert Storm there were "only a few hundred" GPS receivers available to coalition forces. Emergency production of GPS receivers allowed almost every type of weapon, platform, vehicle, or units access to positional data; this data was critical in the featureless terrain of the desert.[37,38] The GPS receiver was "the most popular new piece of equipment in the Desert."[39]



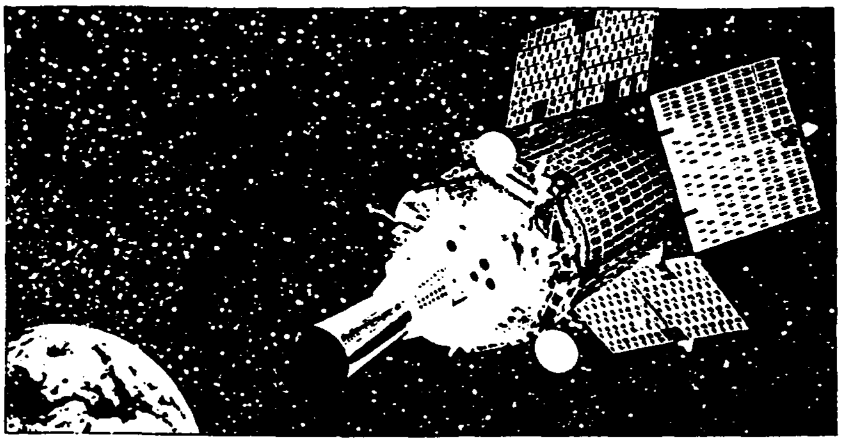
GPS Satellite

Although the procurement "tap" was turned to "full open" for GPS receivers, 90% of them were commercial receivers without selective availability, the feature which allowed authorized users access to extremely highly accurate encrypted positional data.[40] Had the enemy been more capable, exploitation of GPS would have been possible simply by procuring commercial GPS terminals. General applications of GPS included photomapping, all-weather weapon delivery, and precise enroute navigation for air, land, and sea forces.[41] Specific uses of GPS data included: navigation data for the Tomahawk Land-Attack Missile; mid-course guidance updates for the Stand-off Land Attack Missile (which provided better target acquisition by the terminal sensor); improved emitter source location for reconnaissance aircraft (such as the RC-135); navigation data for vehicles, aircraft, ships, and infantry;[42] aiding minefield clearance; keeping units out of each other's fire zones; supporting search and rescue operations;[43] and even navigation data for such routine tasks as cooks delivering hot food to front-line troops.[44]

Warning

Another of the major space contributors to the Gulf War was the system known as the Defense Support Program (DSP). DSP satellites, located in geosynchronous orbit 22,300 miles over the earth's equator, detected heat generated by ballistic missile launches[45] through an infrared sensor (also capable of detecting nuclear detonations).[46] These satellites used a 12-

foot telescope to collect infrared energy in a Schmidt-type optical sensor and focus it onto an array of 2,000 detectors. Each detector covered an area slightly smaller than two square miles. From the ballistic missile heat plume, the DSP satellite system determined the launch site. The data was relayed via satellite and ground stations[47] to North American Air Defense Command (NORAD) located deep within the protective granite of Cheyenne Mountain, southwest of Colorado Springs, CO.[48]



DSP Satellite

These satellites detected Iraqi Scud missile launches, giving precious minutes to military and civilian authorities in both Saudi Arabia and Israel, so that emergency alarms could warn of impending Scud missile attack.[49] To facilitate this kind of theater warning, a unique command, control, and communications network had to be improvised to get the warning data in theater.[50] DSP had never been thought of in terms of anything other than "cold war sentry duty."[51] This ad hoc network was put in place over a period of time, without benefit of an operations plan, either in complete format or in concept. Although a rudimentary capability was in place by August, it took time to refine and mature the process and procedures.[52] In retrospect, General Horner stated, "I was already aware of the danger from Scuds before we went to the Gulf, but it never occurred to me to use DSP to provide warning of Scud attacks...but shame on me, I should have known."[53]

At the operational level of war, conventional Scud missiles were not a major military threat. But in the Gulf War, the threat of biological, chemical, or even nuclear warheads could transform the size, shape, and scope of the war in an instant. But perhaps even more of a threat to the operational commander was the use of the Iraqi Scuds as a political weapon against a frail coalition of unlikely Western and Middle-East allies. Scud missile attacks aimed at Israel, designed to bring Israel into the war against Iraq, could have fragmented the coalition, eroding the underlying base of United Nations authority and credibility. DSP early warning, coupled with deployed Patriot missiles, may well have been the compelling reason Israel did not directly respond with force to Iraq's attempt to draw them into the war. This was one of space's greatest contributions to the success of the Persian Gulf War.

IMPLICATIONS, RECOMMENDATIONS, AND CONCLUSIONS

Although U.S. military space systems are generally adequate,[54] there are specific shortfalls in the force enhancement arena which must be addressed. Only ingenious adaptation, resourcefulness, and ad hoc procedures enabled the force enhancement assets of space to truly support the operational commander and the terrestrial warfighter during Desert Shield/Desert Storm. Without question, good fortune allowed six months to get ready. The next time, that luxury may not exist and we must be prepared.

First, a key element--the development of space doctrine to support the warfighters. This will provide guidance and direction to warfighters at all levels of war across the full spectrum of conflict. It will go a long way towards preventing the operational commander in the next war from being ignorant of the capabilities of space and will help to integrate space capabilities into the campaign right from the start. The operational commander must know what space can do and how to exploit it to prepare the battlespace and control the battle. Space doctrine must be a "living" document that is critically analyzed and one that matures over time, for surely there will be future evolutions in the arena of space warfare.

Second, an approved space control strategy must emerge from within the Department of Defense; in the Gulf War, U.S. space forces were virtually unopposed, but the next conflict may well be different. There are a growing number of countries, such as France, and organizations, such as the news media, that possess or have access to space capabilities that can threaten or undermine our warfighting capabilities. Expanding commercial reconnaissance capability, such as the French satellite SPOT, will continue to be sold in the world marketplace and may not be able to be "cut off" as it was to the Iraqis in the Gulf War. For example, one satellite photo from a commercial satellite in the hands of Saddam Hussein could have destroyed the surprise and maneuver--both strategic and tactical--of the "left hook" during Desert Storm.[55] Moreover, the unintentional, potentially devastating real-time intelligence information broadcast to not only the public, but also to the enemy by an overzealous, rating-conscious media may acerbate the problem. These expanding, non-military capabilities must be acknowledged, considered, and included in a viable space control strategy. While the former Soviet Union is the only nation that has a true Anti-Satellite (ASAT) capability, the development of ASATs by other countries in the near future must be considered. A space control strategy must be one that is systematic and coordinated, one that considers the realities of the environment. Entrenched and antiquated thinking, such as "gotta have an ASAT," must be discarded in favor of realistic political, military, and economic alternatives. For example, the U.S. Air Force Chief of Staff, General Merrill A. McPeak, recently stated, "Suffice it to say, an ASAT is only one of a set of a much larger set of tools we need to control the space environment...[but,] we are not restarting ASAT."[56] Echoing that, Major General William E. Jones, AFSPACECOM Director of Operations, stated that "You don't need to take out a satellite to deny its use...There are other means as well--you can interdict (satellite data) on the ground. Technology is not the problem and I don't think it ever has been."[57] Nevertheless, we need to step out and integrate offensive capability--both lethal and non-lethal--into our space control strategy.

Third, consideration must be given to system requirements that suit the needs of the terrestrial warfighter--perhaps something less than a "100% spoof-proof, super-secure, anti-jam, electromagnetic hardened, mega-channel Cadillac" will fit not only the resource limitations of the future, but the needs of the operational and tactical warfighter as well. Although the capability of U.S. space systems are second to none, they have been postured for the cold war and peacetime operations, leaving a tremendous gap in the ability of space forces to function at lower levels of war. During the Gulf War for example, communications capability shortfalls at the operational and tactical levels were filled by acquiring whatever system could be used, leased, or commandeered, and less capable systems often saved the day. Although the next war will certainly be different, the lesson learned is that there are viable alternatives to do-it-all systems and they must be explored in light of the new fiscal realities. In an era of downward spiraling resources, the continued development and deployment of *appropriate* military systems must progress, coupled in the near-term with a commercial surge capability and use of our allies' space assets whenever possible.

Fourth, we must alter and reorient our way of thinking to fit the post-cold war realities. For example, warning systems must continue to "fail to the safe side." Cold war warning systems were designed to prevent launching a nuclear strike based on a false alarm. But soon, seventeen nations will possess a nuclear, biological, or chemical warhead ballistic missile capability. In order to "fail to the safe side" with ballistic missile systems, ambiguous and false warning must now be tolerated. At levels of war lower than strategic nuclear, the threshold must be of sufficient level to provide warning to deployed forces in the CINC's area of responsibility. In addition, forces must be adequately trained and prepared to conduct offensive negation operations, employ defensive countermeasures, and undertake safety precautions. Operational communications networks and procedures to the CINCs must be established and integrated into the warfighter's planning process and operational arsenal of force enhancement capabilities. Clearly, cold war warning systems and thinking must be altered to fit the new paradigm.[58] General Horner has stated the bottom line:

> "What we have to do is change our emphasis from strategic war to theater war. We have to get over the cold war and make sure that we're equipping and training and organizing to fight the kind of war that's probably going to be thrust upon us. All of us in the space community must concentrate our thinking on how we can directly support the warfighters."[59]

Fifth, we must be organizationally prepared to extract the maximum possible from the vast potential of space. Ingenious adaptation, resourcefulness, and ad hoc procedures will not meet the needs of a CINC involved in a future no-notice regional contingency. In order to "fix the problem," some have suggested the concept of a theater "JFSCC" (Joint Force Space Component Commander), similar to the Joint Force Air Component Commander (JFACC). But the global, orbital nature of satellites implies a scope outside the realm of a theater-focused JFSCC. For example, the unique nature of many space assets, such as our own "low fliers" that circle the globe every 90 minutes, lend themselves to providing support for *more* than just one commander or user at a time--they are truly a national asset. On the other hand, one CINC may have a requirement to negate an enemy reconnaissance satellite, while another may have embarked on an operation to deceive that same *operational* enemy satellite. Clearly, close and careful coordination in the space arena on a global scale is required. But the time for a theater-focused "JFSCC" has not yet come. Under the current specified and unified command structure, there is a "JFSCC," otherwise known as USCINCSPACE (Commander-in-Chief, U.S. Space Command), already charged with providing support to the terrestrial warfighter and the other supporting CINCs, as previously discussed. USSPACECOM, with its service components, has the organizational resources in-place to carry out this mission--this asset just needs to be tapped and exploited. To fully integrate and prioritize the capabilities of space into the warfighting CINC's plan or operation, the supported CINC's staff must work closely with the staff and operational elements of USSPACECOM. And the time to do it is now, before the first shot is fired.

Sixth, the distinctions among the strategic, operational, and tactical levels of war will tend to be less distinct in the future. This is due to the more regional and tightly-controlled nature of possible near-term future conflicts and the impact of technology in speeding up the tempo of the battlespace, coupled with the American cultural expectation of quick, decisive wars with minimum loss of life. Clearer definition between the levels of war may not be evident until the conflict is much broader in size, shape, and scope than Desert Storm. This is a reality that, at the least, must be recognized and appropriately assimilated at the operational level of war.

It is a military axiom to "take the high ground"--and space is the ultimate high ground. In the Gulf War, U.S. space forces were virtually unopposed, but in the future, that may not be the case. We must be prepared to take the high ground of space--and keep it, for the active use of space by the enemy could well be an Achilles' heel for future military operations. We must look forward with an eye on the changing geopolitical and economic realities of the future; only a fiscally responsible, realistic acquisition and integration strategy, coupled with a coordinated space control strategy and evolving space doctrine aimed at supporting the needs of the warfighting CINCs will, *ensure* the high ground for the 21st century.

NOTES

[1] This paper builds upon an earlier work by the author, entitled "Desert Storm: The First Space War," submitted in partial fulfillment of Naval War College requirements.

[2] Craig Covault, "Desert Storm Reinforces Military Space Direction," Aviation Week & Space Technology, April 8, 1991, p. 42.

[3] Survivability includes electronic hardening to prevent interference with payload or command and control function.[8]

[4] U.S. Congress has prohibited U.S. ASAT weapon development.

[5] Robyn. A Chumley, " Guarding the High Frontier," Airman Magazine, March, 1992, p. 25.

[6] BMEWS mission is to detect the launch of intercontinental ballistic missiles (ICBMs). BMEWS sites are located at Clear AFS, AK; Thule AB, Greenland; and RAF Fylingdales, UK.

[7] Pave Paws mission is to detect launch of submarine-launched ballistic missiles (SLBMs). Pave Paws sites are located at Cape Cod AFS, MA; Beale AFB, CA; Robins AFB, GA; and El Dorado AFS, TX.

[8] "Satellite Operations," Air Force Space Command, Office of Public Affairs, Headquarters Air Force Space Command, Peterson AFB, CO, May 1992, p. 12, 13.

[9] Note the necessity for two launch centers in the United States. Satellite payloads determine the final orbit of the satellite. Prograde launches (i.e. with the earth's rotation) are from the east coast and retrograde launches are from the west coast; this prevents debris, such as spent rocket bodies, from falling over inhabited land areas.

[10] Richard H. Buenneke, Jr., "The Army and Navy in Space," Air Force Magazine, August 1990, p. 39.

[11] Jeffrey Rowe, "U.S. Space Command: Managing Critical Military Assets in Space and on the Ground," Defense Electronics, March 1992, p. 37.

[12] Ibid.

[13] Conduct of the Persian Gulf War, Final Report to Congress, (Washington: Department of Defense, April 1992), p. K-26.

[14] Ibid., p. K-25.

[15] Thomas S, Moorman, Jr., "SPACE A NEW STRATEGIC FRONTIER," Airpower Journal, Spring 1992, p. 19.

[16] Conduct of the Persian Gulf War, Final Report to Congress, (Washington: Department of Defense, April 1992), p. K-31.

[17] William A. Dougherty, "Storm from Space," Proceedings, August 1992, p. 51.

[18] Conduct of the Persian Gulf War, Final Report to Congress, (Washington: Department of Defense, April 1992), p. K-32.

[19] Thomas S, Moorman, Jr., "SPACE A NEW STRATEGIC FRONTIER," Airpower Journal, Spring 1992, p. 19.

[20] Conduct of the Persian Gulf War, Final Report to Congress, (Washington: Department of Defense, April 1992), p. K-33.

[21] Ibid., p. K-35.

[22] Rocky Roland, "Space Capabilities and Limitations," Unpublished Paper, NWC 3161, U.S. Naval War College, Newport, RI: Undated, p. 5.

[23] Conduct of the Persian Gulf War, Final Report to Congress, (Washington: Department of Defense, April 1992), p. K-35.

[24] Jeffrey Rowe, "U.S. Space Command: Managing Critical Military Assets in Space and on the Ground," Defense Electronics, March 1992, p. 42.

[25] Craig Covault, "Desert Storm Reinforces Military Space Direction," Aviation Week & Space Technology, April 8, 1991, p. 43.

[26] Rocky Roland, "Space Capabilities and Limitations," Unpublished Paper, NWC 3161, U.S. Naval War College, Newport, RI: Undated, p. 11.

27 Jeffrey Rowe, "U.S. Space Command: Managing Critical Military Assets in Space and on the Ground," Defense Electronics, March 1992, p. 42.

28 Conduct of the Persian Gulf War, Final Report to Congress, (Washington: Department of Defense, April 1992), p. K-40.

29 Rocky Roland, "Space Capabilities and Limitations," Unpublished Paper, NWC 3161, U.S. Naval War College, Newport, RI: Undated, p. 11.

30 Ibid.

31 Thomas S, Moorman, Jr., "SPACE A NEW STRATEGIC FRONTIER," Airpower Journal, Spring 1992, p. 19.

32 Conduct of the Persian Gulf War, Final Report to Congress, (Washington: Department of Defense, April 1992), p. K-40.

33 Thomas S, Moorman, Jr., "SPACE A NEW STRATEGIC FRONTIER," Airpower Journal, Spring 1992, p. 19.

34 James W. Canan, "Space Gets Down to Earth," Air Force Magazine, August 1990, p. 33.

35 William A. Dougherty, "Storm from Space," Proceedings, August 1992, p. 50.

36 Ibid.

37 Thomas S, Moorman, Jr., "SPACE A NEW STRATEGIC FRONTIER," Airpower Journal, Spring 1992, p. 19.

38 William A. Dougherty, "Storm from Space," Proceedings, August 1992, p. 51.

39 Ibid.

40 Conduct of the Persian Gulf War, Final Report to Congress, (Washington: Department of Defense, April 1992), p. K-42.

41 Rocky Roland, "Space Capabilities and Limitations," Unpublished Paper, NWC 3161, U.S. Naval War College, Newport, RI: Undated, p. 9.

[42] Conduct of the Persian Gulf War, Final Report to Congress, (Washington: Department of Defense, April 1992), p. K-41.

[43] William A. Dougherty, "Storm from Space," Proceedings, August 1992, p. 51.

[44] Thomas S, Moorman, Jr., "SPACE A NEW STRATEGIC FRONTIER," Airpower Journal, Spring 1992, p. 19.

[45] "Strategic and tactical ballistic missile warning," Air Force Space Command, Office of Public Affairs, Headquarters Air Force Space Command, Peterson AFB, CO, May 1992, p. 9.

[46] Jeffrey Rowe, "U.S. Space Command: Managing Critical Military Assets in Space and on the Ground," Defense Electronics, March 1992, p. 36.

[47] Rocky Roland, "Space Capabilities and Limitations," Unpublished Paper, NWC 3161, U.S. Naval War College, Newport, RI: Undated, p. 8.

[48] James W. Canan, "Space Support for the Shooting Wars," Air Force Magazine, Vol. 76, No. 4, April 1993, p. 30.

[49] Corporation for Public Broadcasting, "Celestial Sentinels," Space Age, A production of WQED, Pittsburgh and NHK, Japan in association with the National Academy of Sciences, 1992.

[50] William A. Dougherty, "Storm from Space," Proceedings, August 1992, p. 48.

[51] James W. Canan, "Space Support for the Shooting Wars," Air Force Magazine, Vol. 76, No. 4, April 1993, p. 31, 32.

[52] William A. Dougherty, "Storm from Space," Proceedings, August 1992, p. 50.

[53] James W. Canan, "Space Support for the Shooting Wars," Air Force Magazine, Vol. 76, No. 4, April 1993, p. 32.

[54] "Space Projects need Booster Shots," Defense, November-December 1992, p.25.

[55] Neff Hudson and Andrew Lawler, " McPeak calls for new space systems," Air Force Times, April 26, 1993, p. 6.

[56] Ibid., p. 3.

[57] Ibid., p. 6.

[58] James W. Canan, "Space Support for the Shooting Wars," Air Force Magazine, Vol. 76, No. 4, April 1993, p. 32.

[59] Ibid., p. 32, 33.

BIBLIOGRAPHY

Buennеke, Richard H., Jr. "The Army and Navy in Space." Air Force Magazine, Vol. 73, No. 8, August 1990, p. 36-39.

Canan, James W. "Space Gets Down to Earth." Air Force Magazine, Vol. 73, No. 8, August 1990, p. 30-34.

Canan, James W. "Space Support for the Shooting Wars." Air Force Magazine, Vol. 76, No. 4, April 1993, p. 30-34.

Chumley, Robyn A. " Guarding the High Frontier." Airman Magazine, March, 1992, p. 20-25.

Conduct of the Persian Gulf War, Final Report to Congress. Washington: Department of Defense, April 1992.

Corporation for Public Broadcasting. "Celestial Sentinels." Space Age, A production of WQED, Pittsburgh and NHK, Japan in association with the National Academy of Sciences, 1992.

Covault, Craig. "Desert Storm Reinforces Military Space Direction." Aviation Week & Space Technology, Vol. 134, No. 14, 8 April 1991, p. 42-47.

Dougherty, William A. "Storm from Space." Proceedings, August 1992, p. 48-52.

Hudson, Neff and Lawler, Andrew. " McPeak calls for new space systems." Air Force Times, 26 April 1993, p. 3, 6.

Moorman, Thomas S., Jr. "SPACE A NEW STRATEGIC FRONTIER." Airpower Journal, Spring 1992, p. 14-23.

Roland, Rocky. "Space Capabilities and Limitations." Unpublished Paper, NWC 3161, U.S. Naval War College, Newport, RI: Undated.

Rowe, Jeffrey. "U.S. Space Command: Managing Critical Military Assets in Space and on the Ground." Defense Electronics, March 1992, p. 35-45.

"Satellite Operations." Air Force Space Command, Office of Public Affairs, Headquarters Air Force Space Command, Peterson AFB, CO, May 1992.

"Strategic and tactical ballistic missile warning." Air Force Space Comma Office of Public Affairs, Headquarters Air Force Space ommand, Peterson AFB, CO, May 1992.

"Space Projects need Booster Shots." Defense, November-December 1992, p. 22-25.